published a bulky volume of English phrases, is now preparing a series of schoolbooks for use in Chinese government schools. An English reading-book for beginners, an elementary geography, a series of conversation books, and a manual of English correspondence have either been already published, or will shortly appear. Among many other indications of the steady, though slow, advance of the Chinese in this direction, the Peking correspondent of the *North China Herald* refers with regret to the retirement from business of Mr. Yang, a well-known pawnbroker of the metropolis. In addition to the ordinary duties of his calling this individual appears to have studied chemistry, mechanical science, French, mineralogy, medicine, and other subjects of a similar kind. He owned gasworks, steam-engines, a complete pharmacopeia of drugs, photographic apparatus, and a geological cabinet. It is to be hoped that Mr. Yang has prospered in his business, because he has retired to his native province, Shansi, where he intends prosecuting enterprises for coal and iron mining, and other appliances of foreign machinery. When tastes of this kind extend to the shrewd and enterprising Chinese traders, we need not despair of the outlook for science in China.

SOME time since we alluded to the work done in China by an American female physician, Miss Dr. Howard. She has attended the mother of Li Hung Chang, the great Viceroy, and now we read she is treating the wife of the same high official. The fame of the lady doctor appears to have spread far and wide over North China, and she is now flooded with applications for assistance and advice from the women of wealthy families, who would die rather than be treated by a foreign male physician. It looks as if the various countries of the East offered an almost inexhaustible field for women possessing medical knowledge and skill.

THE Annual Report of the Glasgow Museum is as favourable as can be expected, considering the totally inadequate space allotted for the purpose in one of the wealthiest cities of the world.

PROF. H. CARRINGTON BOLTON has issued in a separate form his address on Chemical Literature, delivered before the American Association at Montreal last year.

FOR Baron Nordenskjöld's coming expedition to Greenland a flying-machine is now being constructed in Gothenburg. The apparatus, a kind of flying or air-sailing machine, is the invention of a Swedish engineer, Herr A. Montén, who is now constructing the same at the expense of Dr. Oscar Dickson.

ON the night of April 3, frequent and violent shocks of earthquake were felt at Pedara in Sicily.

THE additions to the Zoological Society's Gardens during the past week include a Leonine Monkey (*Macacus leoninus* ♂) from Arracan, presented by Mr. A. G. Henry; a Mule Deer (*Cervus macrotis* ♀) from North America, presented by Judge Caton, C.M.Z.S.; a Common Squirrel (*Sciurus vulgaris* ♀), British, presented by Miss A. M. Frost; a Common Pintail (*Dafila acuta* ♂), British, presented by Mr. Frank Seago; a Grey-lag Goose (*Anser ferus*), British, presented by Mr. Vincent W. Corbett; four Palmated Newts (*Triton palmipes*), British, presented by Mr. J. E. Kelsall; a Radiated Tortoise (*Testudo radiata*) from Madagascar, deposited; a Black Saki (*Pithecia satanas* ♀), a White-bellied Parrot (*Caica leucogastra*) from the Amazons, a Talapoin Monkey (*Cercopithecus talapoin* ♂), four Harlequin Quails (*Coturnix histrionica* ♂ ♂ ♀ ♀) from West Africa, a Brazilian Blue Grosbeak (*Guiraca cærulea*), four Saffron Finches (*Sycalis flaveola* ♂ ♂ ♂ ♀) from Brazil, purchased.

OUR ASTRONOMICAL COLUMN

D'ARREST'S COMET.—On April 4 a.m. this comet was re-observed by Dr. Hartwig with the 20-inch refractor of the Observatory of Strasburg, near the position indicated by the elements of M. Leveau of Paris. The observation is a notable one, having been made at the great interval of 285 days from the date of perihelion passage; no other comet of short period has been hitherto observed under such circumstances, indeed there is only one instance upon record where a comet has been observed further from perihelion passage, and this was in the case of the celebrated comet of 1811, which was in perihelion on Sept. 12 in that year, and was followed by Wisniewsky till Aug. 17, 1812, or 309 days after its nearest approach to the sun. The great comet of 1861 was observed at Pulkowa 284 days after perihelion.

The comet in question was discovered by the late Prof. D'Arrest at Leipsic on June 27, 1851, and was observed at Berlin till October 6; its periodicity was pointed out by the same astronomer in the first week in August. MM. Oudemanns and Schulze specially occupied themselves with the investigation of its orbit in this year. At the next return in 1857 its position did not allow of observations in this hemisphere, but it was observed at the Royal Observatory, Cape of Good Hope, on December 5, and followed until January 18, 1858. The ensuing perihelion passage took place at the end of February, 1864, but from the unfavourable track of the comet in the heavens no observations were procured. During this revolution the comet had approached the planet Jupiter within about 0·36 of the earth's mean distance from the sun, and large perturbations of the elements were thereby produced; the nearest approach occurred in April, 1861. At the returns in 1870 and 1877 observations sufficient for the correction of the elements were obtained; the later investigation of the comet's motion has been ably conducted by M. Leveau.

In 1851 at perihelion the comet was distant from the earth's orbit only 0·162; at the present time this distance has been increased by perturbation to 0·316. There is a very close approach to the orbit of Jupiter, in heliocentric longitude 154°, or at an angular distance of about 165° before perihelion. In the orbit of 1870 the distance was 0·0845, in that of 1884 it is 0·1232; the presumption will therefore be that the attraction of this planet has fixed the comet in the system.

The following positions are calculated from M. Leveau's predicted elements; the perihelion passage occurs 1884, January 13 5765 G.M.T. :—

At Greenwich Midnight

	R.A. h. m. s.	Decl. ° ′	Log. distance from Earth.	Sun.
April 23,	13 38 14 ...	+11 13·7 ...	0·2951 ...	0·4649
25, ,,	36 25 ...	11 27·6		
27, ,,	34 37 ...	11 40·8 ...	0·2927 ...	0·4609
29, ,,	32 50 ...	11 53·2		
May 1, ,,	31 3 ...	12 4·7 ...	0·2912 ...	0·4569
3, ,,	29 18 ...	12 15·3		
5, ,,	27 35 ...	12 25·1 ...	0·2906 ...	0·4528
7, ,,	25 55 ...	12 33·9		
9, ,,	24 18 ...	+12 41·7 ...	0·2908 ...	0·4486

THE SOLAR ECLIPSE IN MAY.—On May 7, on the eastern coast of Australia, the sun will rise in a sea-horizon about the time of greatest eclipse. With favourable weather the observation will be a very interesting and unusual one, more particularly about Sydney, where the magnitude of the eclipse is greatest. It will be seen from the maps in our ephemerides that totality does not reach Australia, but at Sydney the sun will rise at 6h. 38m., within a quarter of an hour after the middle of the phenomenon, when the magnitude will be 0·95. In Queensland the magnitude diminishes to 0·75, and the sun will be in the horizon at greatest phase. At the former place, therefore, a narrow crescent emerging from the sea-horizon will constitute apparent sunrise.

PHYSICS IN RUSSIA DURING THE LAST TEN YEARS[1]

THE Russian Physical Society was founded only ten years ago, and since its foundation it has become the centre of all researches in physics carried on in Russia, which were limited before to a few dissertations written by Russian Professors of Physics in German Universities, and to a few memoirs communicated to the Academy of Sciences. At present the

[1] Historical sketch of the work done by the Physical Society at the University of St. Petersburg during the last ten years by N. Hesehus in the *Journal of the Russian Chemical and Physical Society*, vol. xiv. fasc. ix.

Society has 120 members, a capital of 1638*l.*, a library, and a physical laboratory, mostly of instruments presented by M. Bazilevsky. As to the scientific communications made to the Society, they are of great value, as will be seen from the following brief summary.

The first rank among them belongs to the researches of Prof. Mendeléeff, which are nearly all connected with his extensive work on the elasticity of gases, these last leading him to a great number of collateral researches, and to the invention of new methods and instruments. Such are, for instance, his communications:—1. On a differential naphtha-barometer intended to show small changes of pressure. 2. On a levelling instrument, being a modification of the former, and easily showing changes of level of one metre; it might be applied also to the measurement of the changes of density of air; an entire memoir was written by M. Mendeléeff to describe this apparatus, which is susceptible of so many applications. 3. On a means of boiling mercury in barometers. 4. On a new siphon-barometer, which is, so to say, a combination of two siphon barometers connected together in their upper parts, one of the two tubes being capillary, and serving to exhaust the air which may penetrate Torricelli's vacuum, and for filling the instrument with mercury. 5. On a mercury pump which eliminates the disadvantages of friction. 6. On a very sensitive differential thermometer. 7. On a formula of expansion of mercury from temperature: the volume at a temperature t being $= 100{,}000 + 17{\cdot}99\ t + 0{\cdot}002112\ t^2$, where 100,000 represents the volume at zero. 8. On the coefficient of expansion of air; the experiments were made with great accuracy, and the volumes measured by the weight of mercury; the coefficient was found to be $\alpha = 0{\cdot}0036843$. 9. On the temperature of the upper strata of the atmosphere; according to the measurements of Mr. Glaisher, Prof. Mendeléeff found that the increase of temperature (t) is equal to the increase of pressure (H); that is, $\frac{dt}{dH} = Const.$, or $t = C + H\frac{t_0 - C}{H_0}$. Taking, then, into account the influence of moisture, Prof. Mendeléeff deduced, from the laws of the mechanical theory of heat, a formula which better agrees with observations than the formula of Poisson, deduced for dry air. An accurate knowledge of the law of changes of temperature in the upper parts of the atmosphere having an immense importance for meteorology, astronomy, and cosmography, Prof. Mendeléeff elaborated a thorough scheme of aërostatic observations in Russia. 10. On a general formula for gases; instead of the well-known formulæ of Clapeyron, he proposes the following, which embodies the laws of Marriott, Gay-Lussac, and Avogadro:—$A\,P\,V = KM\,(C + T)$, where M is the weight of the gas in kilogrammes, and A – its molecular weight, the atomic weight of hydrogen being taken as unity; K is a constant for all gases, whilst the R of Clapeyron varies with the nature and mass of the gas. 11. On the compressibility of air under pressures less than that of the atmosphere; the chief results for pressures from 650 millimetres to 0·5 millimetre are: the law of Marriott not only is not true for low pressures, but the disagreement increases as the pressure decreases; the produce PV (pressure multiplied by the volume), at pressures from 0·5 to 650 millimetres, *increases* for the air approximately from 100 to 150, instead of decreasing, as resulted from Regnault's measurements under higher pressures. This result was so unexpected and so contrary to current opinion that the measurements were repeated many times and by different methods, but the result was always the same. So it must be inferred (to use Prof. Mendeléeff's own words) "that as the rarefaction of gases goes on, a maximum volume, or limit volume, is reached, like the minimum or limit volume reached at compression; therefore it cannot be said that a gas, when rarefied, merges into luminous ether, and that the atmosphere of the earth has no limits." The rarefied gas becomes, so to speak, like a solid body. If the pressure on a solid is diminished its volume increases, but at a pressure equal to zero it still attains a limit volume. There are many other communications of less importance which were made also by Prof. Mendeléeff.

Some communications by M. Kraevich were also connected with the same subject. He made investigations into the degree of rarefaction reached in mercury-pumps; into the luminous phenomena in Geissler tubes; into the dissociation of sulphuric acid and glycerine in vacuum, and so on. A special interest is attached to his preliminary experiments on rarefied air by a new method, which experiments lead to the conclusion that "after a certain limit of rarefaction the elasticity decreases much more rapidly than the density, and at a very great degree of rarefaction the air loses its elasticity." These experiments would thus confirm the researches of Prof. Mendeléeff.—M. Kraevich has described an improved barometrograph, a portable barometer, and a mercury-pump of his own invention.

Several improvements of the barometer were proposed, too, by MM. Shpakovsky, Gurkovsky, Reinbot, and others. M. Lachinoff has proposed a mercury-pump without cocks. To the same department belong also the researches by M. Rykacheff into the resistance of the air; by M. Eleneff, on the coefficients of compressibility of several hydrocarbons; by M. Sreznevsky, on the evaporation of water-solutions of the chlorate of zinc; and by M. Schiff, on the compression of indiarubber cylinders.

In mechanics and mechanical physics M. Hesehus notices the works, by M. Bobyleff, on the weighing methods of Borda and Gauss; on the length of the seconds-pendulum at Kharkoff, by M. Osiroff, and several other communications by MM. Bobyleff, Schiller, Lapunoff, and Gagarin.

Calorific phenomena were the subject of many communications, we notice these: On the calibration of thermometers, by MM. Mendeléeff and Lermontoff; on the expansion of mercury and gases, by M. Mendeléeff; a formula of expansion of mercury and water, by M. Rosenberg; on the expansion of indiarubber, by M. Lebedeff; on a new method of determining the caloric conductibility of bodies by heating them at one end, by Prof. Petrushevsky; and several communications on the critical temperature, by MM. Avenarius, Jouk, and Strauss.

The communications on optics were numerous, and we notice among them the descriptions of an optical micrometer based on Newton's rings; and of a spectrophotometer, by Prof. Petrushevsky; the very interesting researches of M. Ewald on the phenomena of vision; the researches into the chemical action of light, by M. Lermontoff, who has tried to prove that light produces a dissociation of molecules and a new distribution of atoms whose return to their former distribution produces the phenomena of phosphorescence; several communications dealing with reflexion in mirrors; several papers on spectrum analysis; and researches dealing with photography.

The communications on electricity were as numerous as all the others taken together, the chief of them being: On the distribution of electricity on spheres under different conditions, and two other papers on electrostatics, of less importance, by M. Bobyleff; on the magnetisation of fine steel cylinders, by M. Khivolson, who has proposed a theory of residual magnetism, explaining these phenomena by the influence of molecules of carbon, which prevent to some extent the rotation of the molecules of iron; researches by M. Van der Flith on the mechanism of the interior and exterior phenomena of the current, which are explained by the molecular rotation in the circuit and by the breaking of equilibrium in the surrounding ether; the papers on thermoelectricity by Prof. Petrushevsky and M. Borgman, and several other papers by M. Borgman, Prof. Lenz, and Prof. Umoff; the microscopical researches into the crystallisation of the metal of electrodes, by M. Shidlovsky; and many others which it would be impossible to enumerate in this note. It will be sufficient to mention that the number of proposed electrical apparatus, as well as of papers on electro-technics, was very great, and some of them were of great value.

Cosmical physics was represented by most valuable papers on the resisting medium in space, by M. Asten; on the transits of Venus and Mercury, on variable and double stars, and on the parallax of refraction, by M. Glasenap; on the tails of the comets *b* and *c*, 1881, by Prof. Bredikhin; and by several interesting communications of MM. Woeikoff, Mendeléeff, Rykacheff, Schwedoff, and many others.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 1.—"Contributions to the Chemistry of Storage Batteries," by E. Frankland, D.C.L., F.R.S.

1. *Chemical Reactions.*—The chemical changes occurring during the charging and discharging of storage batteries have been the subject of considerable difference of opinion amongst chemists and physicists. Some writers believe that much of the storage effect depends upon the occlusion of oxygen and hydrogen gases by the positive and negative plates or by the active material thereon; some contend that lead sulphate plays an important